REMARKS

Claims 1-36 are pending in the present application. Claim 10 is amended to comply with Examiner's express requirement for modification. Reconsideration of the claims is respectfully requested.

Amendments were made to the specification to correct errors and to clarify the specification. No new matter has been added by any of the amendments to the specification.

Also, applicants have submitted proposed corrections to drawings (Figure 10A) labeled "Prior Art" in red ink. These changes will be incorporated into a formal set of drawings upon approval of the proposed changes by the Examiner.

I. 35 U.S.C. § 102, Anticipation

Tobise

The examiner has rejected claims 1-6, 10-16 and 20 under 35 U.S.C. § 102(b) as being anticipated by Tobise et al. (U.S. Pat. 5,748,416). This rejection is respectfully traversed.

As per claims 1-6, 10-16 and 20, the office action states:

> Regarding claims 1 and 11, Tobise et al. discloses a reduced sensitivity spin valve sensor apparatus (figure 15), comprising:
> a spin valve sensor; and
> at least one magnetic effect inducing device 21,
> wherein the at least one magnetic effect inducing device induces a magnetic field to the spin valve sensor to thereby reduce a sensitivity of a free layer of the spin valve sensor to applied magnetic fields (column 14, lines 45-48).
>
> ...
>
> Regarding claim 3-5, 13-15, Tobise shows that the at least one magnetic effect inducing device is a pair or permanent magnet stabilizing elements 21 formed of cobalt-platinum/chromium magnets (see column 13, lines 67, and figure 15).

Regarding claims 6 and 16, Tobise discloses that the at least one magnetic effect inducing device reduces the spin valve sensor's propensity to saturate (column 14, lines 21-27).

...

Analysis of Tobise

Claim 1 is reproduced for illustration.

1. A reduced sensitivity spin valve sensor apparatus, comprising:

a spin valve sensor; and

at least one magnetic effect inducing device, wherein the at least one magnetic effect inducing device induces a magnetic field to the spin valve sensor to thereby reduce a sensitivity of a free layer of the spin valve sensor to applied magnetic fields.

[Emphasis added.]

It is respectfully submitted that the Tobise reference does not teach the claimed limitations of the present invention, and in fact this cited reference specifically teaches away from the claims of the present invention.

The present invention is directed to a reduced sensitivity spin valve sensor, as emphasized in the language of claim 1, above: "...to thereby reduce a sensitivity of a free layer of the spin valve sensor to applied magnetic fields." [Emphasis added.] Also, the present specification states this intended goal in several places. For example, page 4, lines 5-20:

> Generally, a variety of different signal flux levels, i.e. levels of the magnetic field generated by the magnetic tape media, can be produce from various data patterns recorded on a magnetic tape. For example, low density patterns present a larger magnetic flux to the spin valve sensor leading to higher signal amplitude than high density patterns which have a lower level of magnetic flux. A spin valve head is typically designed and optimized to read the high density patterns in order

to have significant amplitude for signal detection. However, the high input flux from a low density pattern can drive a spin valve sensor designed for high density operation into non-linear portions of the spin valve response curve. This leads to readback distortions and may even cause the spin valve sensor to magnetically saturate.

Also at page 5, lines 5-10:

Thus, it would be beneficial to have a reduced sensitivity spin valve head for magnetic tape applications in which much of the benefits of standard spin valve sensors are maintained while compensating for excessive input flux that may overpower the spin valve sensor.

Such functionality, reducing the sensitivity of the sensor, is beneficial for applications when legacy technology is read by a modern read head. For example, older magnetic media have wider track widths and thus higher magnetic field intensities than newer magnetic media, which have narrower track widths and thus smaller intensities. The art reference Tobise is directed to <u>increasing sensitivity</u> of the read head, so that smaller track widths can be read. However, this increased sensitivity can create its own problems, such as saturation of highly sensitive read heads when older media with wider tracks are read.

Hence, the present invention is directed toward an entirely different problem than the cited references, and produces the opposite result as stated and intended by the cited references.

For example, col. 5, lines 20-23 of Tobise states:

Further, while Barkhausen noise will be limited, the sensitivity will decrease. Thus, it is necessary to minimize the (Brt) product within a range where Barkhausen nouse can be limited <u>without decreasing sensitivity</u>.

[Emphasis added.]

Also at col. 5, lines 43-49:

> The object of the present invention is to provide a bias-type MR head using a permanent magnet film to handle narrow recorded tracks and provide a narrow gap so that recording density can be increased. A magnetic head is provided that is highly sensitive and that limits Barkhausen noise by optimizing the magnetic properties of the permanent magnet film.

[Emphasis added.]

These passages of Tobise are reproduced to show that the problem addressed by Tobise is different than that of the present invention, and that the solution to this problem is the opposite to that of the present invention. To wit, Tobise seeks to increase sensitivity while suppressing Barkhausen noise. It therefore attempts to maintain as high a sensitivity as possible, and reduces noise by its selection of magnetic films.

In rejecting the present claims 1 and 11, Examiner cites Tobise at col. 14, lines 45-48:

> Referring to FIG. 9 and FIG. 10, there are shown the changes in output and Barkhausen noise elimination in relation to different values of the (Brt) product. As the (Brt) product increases, the output decreases gradually, and then decreases rapidly at 500 Gmicrons or more.

This passage does not appear to teach the limitations of claims 1 or 11, though it does discuss gradual decrease of the output or sensitivity of the read head. However, this passage continues with lines 48-54:

> It is also sees that Barkhausen noise was not found at 200 Gmicrons or higher. The results from this study indicate that a high output can be obtained and Barkhausen noise can be eliminated for the (Brt) product in the range of 200-500 Gmicrons.

[Emphasis added.]

This passage is reproduced to show that Tobise desires and accomplishes a high output, i.e., sensitivity, for the read head, and not reduced sensitivity.

Examiner also cites Figure 15 of Tobise, noting element 21, a permanent magnet. Though a magnet is a "magnetic effect inducing device," it fails to fulfill the claimed limitations of, "wherein the at least one magnetic effect inducing device induces a magnetic field to the spin valve sensor to thereby reduce a sensitivity of a free layer of the spin valve sensor to applied magnetic fields," as claimed in claim 1.

Hence, it is respectfully submitted that Tobise fails to teach the claimed limitations of at least claim 1, and that by teaching that sensitivity should be increased, specifically teaches away from the limitations of claim 1. Further, claim 11 includes limitations similar to claim 1 that are not shown by the Tobise reference. Hence, independent claims 1 and 11 are believed distinguished from the cited reference.

Several dependent claims are also independently patentable over the cited references. For example, claim 6 claims in part, "wherein the at least one magnetic effect inducing device reduces the spin valve sensor's propensity to saturate." According to the teaching of Tobise cited above, Tobise's apparatus decreases noise but maintains or increases high sensitivity. By increasing sensitivity, saturation is made more likely. Hence, it is respectfully submitted that Tobise does not teach or suggest the limitations of claim 6. This argument also applies to claim 16, which depends from independent claim 11.

Miyauchi

The Examiner has rejected claims 1, 7-9, 17-19, 21-36 are rejected under 35 U.S.C. § 102(b) as being anticipated by Miyauchi et al. et al. (U.S. Pat. 5,852,533). This rejection is respectfully traversed.

As per claims 1, 7-9, 17-19, 21-36, the office action states:

> Regarding claims 1 and 11, Moyauchi et al. discloses a reduced sensitivity spin valve sensor apparatus (figures 3-4), comprising:
> a spin valve sensor; and
> at least one magnetic effect inducing device 126,
> wherein the at least one magnetic effect device induces a magnetic field to the spin valve sensor to thereby reduce a sensitivity of a free layer

121 of the spin valve sensor to applied magnetic fields (column 7, lines 58-64).

Regarding claims 7 and 17, Miyauchi discloses that the at least one magnetic effect inducing device is an antiferromagnet layer (column 7, lines 44-46).

Regarding claims 8-9 and 18-19, Miyauchi discloses that the antiferromagnetic layer generate a longitudinal exchange induced bias free layer that reduces the sensitivity of the free layer to applied magnetic fields (column 7, lines 58-66).

Regarding claims 21 and 29, Miyauchi discloses that the at least one magnetic effect inducing device includes a pair of antiferromagnetic layers 124, 126 (see figures 3 and 4).

Regarding claims 22-24 and 30-32, Miyauchi shows that the pair of antiferromagnetic layers includes an antiferromagnetic layer 126 that pins a ferromagnetic layer at zero degrees relative to a long axis of the free layer and an antiferromagnetic layer that pins a ferromagnetic layer 124 at ninety degrees relative to a long axis of the free layer (see figure 4).

Regarding claims 25 and 33, Miyauchi discloses that the first and second antiferromagnetic layers have different blocking temperatures (column 8, lines 52-63).

Regarding claims 26 and 34, Miyauchi shows a ferromagnetic layer 123 spaced from the free layer 121 by a nonmagnetic layer 122 (see figure 3).

Regarding claims 27-28 and 35-36, since the thickness of the spacer layer of Miyauchi is the same as Applicant's, it is inherent that the thickness of the nonmagnetic layer is used to control the ferromagnetic exchange between the ferromagnetic layer and the free layer.

<u>Analysis of Miyauchi</u>

It is respectfully submitted that Miyauchi fails to teach the limitations of the present claims. It is also directed to a different problem than the present application, and also explicitly teaches away from the presently claimed invention.

Examiner cites Miyauchi, against independent claims 1 and 11. Claim 1 is reproduced above. In rejecting claim 1, Examiner cites Miyauchi at col. 7, lines 58-64:

> While the exchange bias magnetic field applied by the magnetic domain control film 126 is required to have a magnitude that is large enough to create a single magnetic domain in the first ferromagnetic film 121 in, for instance, direction (X), <u>if it becomes too large, the reversal of magnetization of the first ferromagnetic film 121 is dulled, reducing the magnetic field sensitivity. Consequently, it is desirable to set the exchange bias magnetic field applied by the magnetic domain</u>

control film 126 at the minimum whereby a single magnetic domain can be achieved in the first ferromagnetic film.

Rather than anticipating the present invention, Applicant respectfully submits that this passage teaches away from the ideas of the present invention, specifically claim1. The above passage of Miyauchi teaches that the bias field is too large, magnetic field sensitivity is reduced. Miyauchi then goes on to explain why this is undesirable, and offers a solution to prevent such a situation from occurring. Rather than expressly reducing sensitivity by providing a magnetic effect inducing device, Miyauchi teaches that such sensitivity must not be reduced, and that this can be accomplished according to Miyauchi's teachings of keeping the bias field at a minimum. This directly contradicts the claims of the present invention, which uses a magnetic effect inducing device reduces the sensitivity of the free layer.

Hence, it is respectfully submitted that Miyauchi fails to teach the limitations of at least claim 1, specifically, "wherein the at least one magnetic effect inducing device induces a magnetic field to the spin valve sensor to thereby reduce a sensitivity of a free layer of the spin valve sensor to applied magnetic fields." [Emphasis added.]

Independent claim 11, which includes similar features as claim 1, is also thereby believed distinguished from the cited reference.

For example, claims 9 and 19 include the limitation, "wherein the aligned atomic moments generate a longitudinal exchange bias field in the free layer that reduces the sensitivity of the free layer to applied magnetic fields." Examiner cites col. 7, lines 58-66, reproduced above, as teaching this reduction in sensitivity. However, the cited passage specifically teaches away from this result by directing those of skill in the art to set the bias field applied to a minimum, so that sensitivity is nor decreased.

For the above stated reasons, it is respectfully submitted that all claims of the present invention are distinguished from the cited references. reconsideration of the claims is respectfully requested.

II. Objection to Claims

The Examiner has stated that claim 10 is objected to. Claim 10 has been amended in accordance with Examiner's express request.

III. Conclusion

It is respectfully urged that the subject application is patentable over the cited references and is now in condition for allowance.

The examiner is invited to call the undersigned at the below-listed telephone number if in the opinion of the examiner such a telephone conference would expedite or aid the prosecution and examination of this application.

DATE: 6.27.03

Respectfully submitted,

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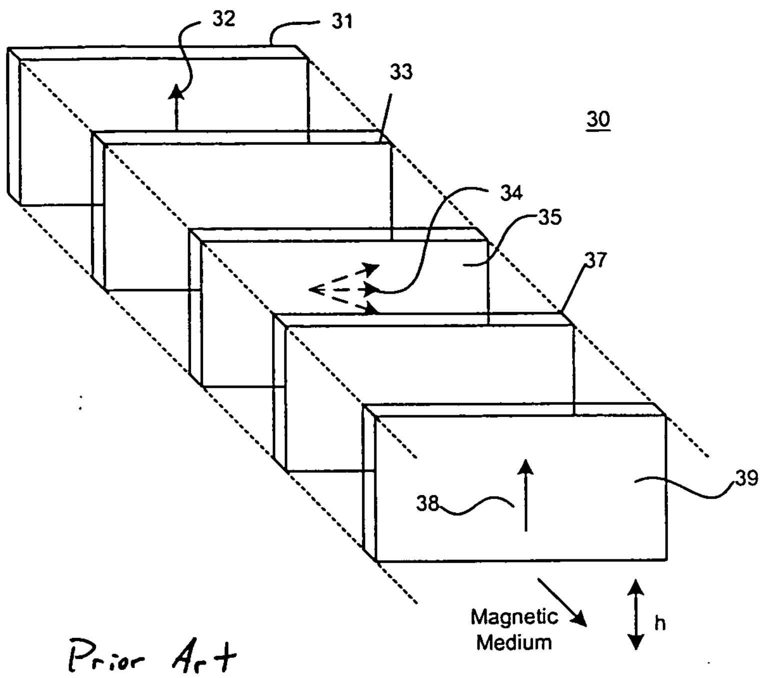

Figure 10A

Dee et al.
2001-019-TAP
Apparatus and Method of Making a
Reduced Sensitivity Spin Valve Sensor
Apparatus in which a Basic Magnetic
Sensitivity is Reduced
Page 10 of 11

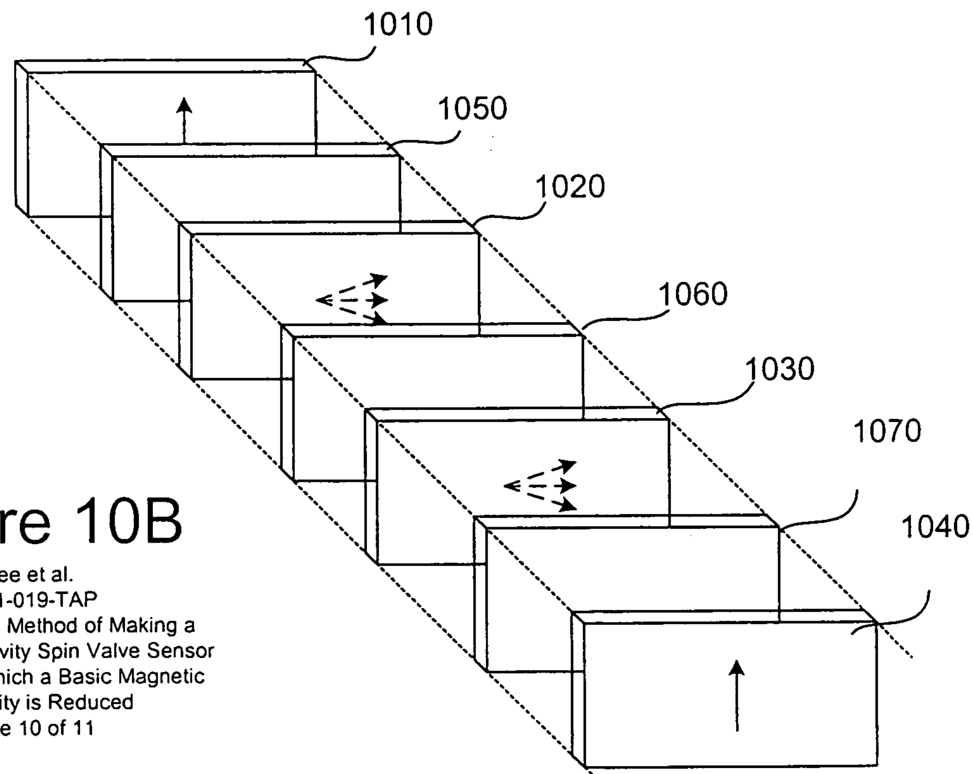

Figure 10B

Dee et al.
2001-019-TAP
Apparatus and Method of Making a
Reduced Sensitivity Spin Valve Sensor
Apparatus in which a Basic Magnetic
Sensitivity is Reduced
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